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ABSTRACT

Noting that technical writing is becoming an increasingly important element in the college curriculum, this journal issue presents eight articles that provide information for use by technical writing instructors. The first article surveys resources and strategies currently available, while the second article reflects upon some of the adjustments and transitions the new teacher of technical writing must face. The third article focuses on the persuasive purpose of technical communication. The fourth considers the dimensions of time and space in technical writing and indicates that technical writing can provide the communication arts with a virtually complete set of formulas for achieving form in functional discourse. The fifth and sixth articles focus on visual perception and emphasize the importance of visual aids, while the seventh article discusses curriculum development and provides suggestions for structuring a technical communication program. The final article treats the subject of the consultant's teaching of technical writing and analyzes what is right and wrong with teaching in the industrial setting. (FL)

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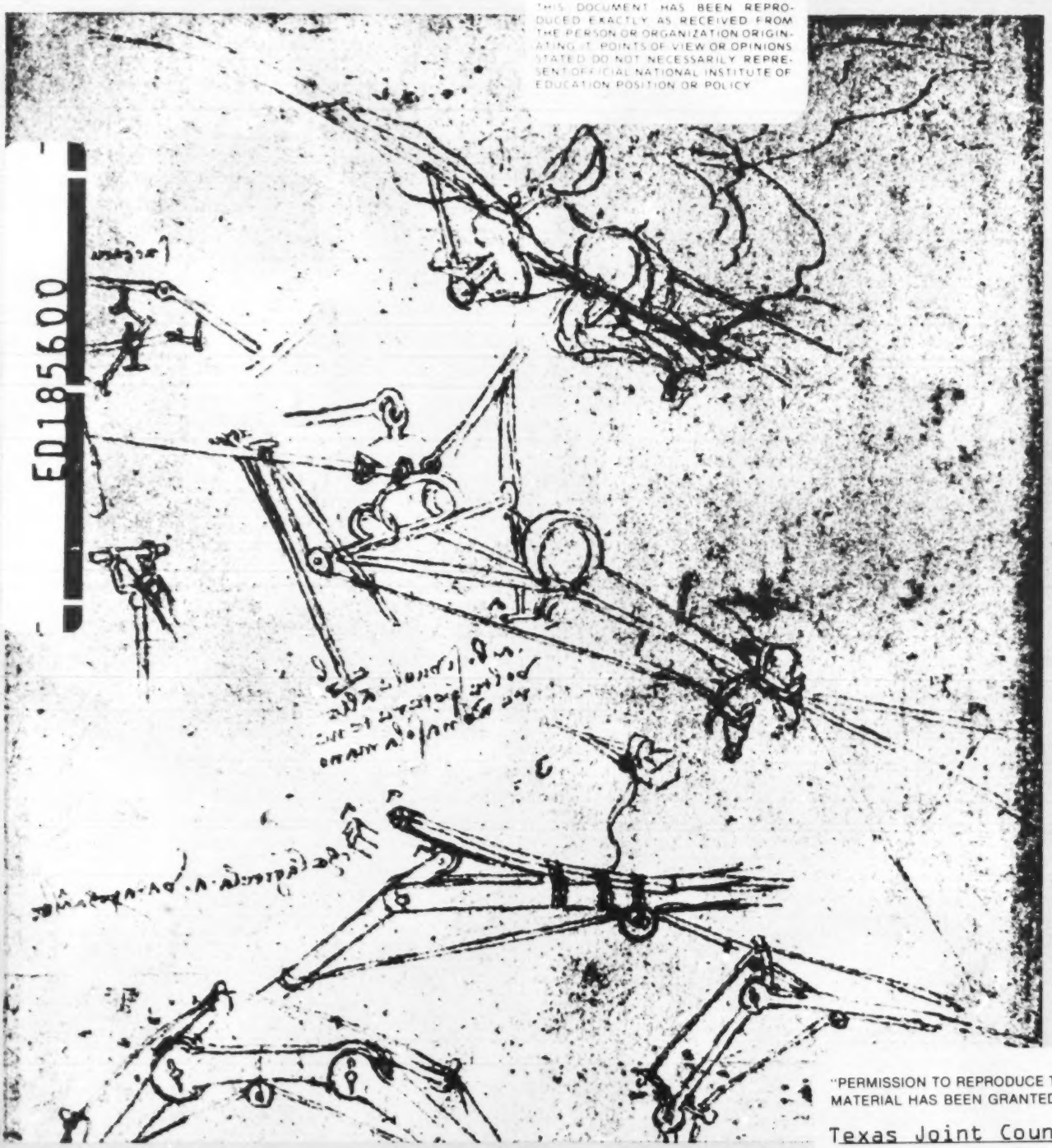

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In this special issue of *English in Texas*, focus is directed toward teaching technical writing. The contributors each approach the topic from a viewpoint which provides clarity and insight into the discipline and its teaching.

Professor Walter surveys resources which will lead the new teacher of technical writing to individual teaching strategies.

Professor Souther reflects upon some of the adjustments and transitions the new teacher of technical writing faces.

Professor Mathes focuses on an often neglected aspect of technical writing. He notes that much important technical communication is inherently persuasive rather than merely informative, yet most discussions do not sufficiently distinguish between the two purposes.

Professor Cockelreas considers the dimensions of time and space in technical writing and indicates that technical writing provides the communication arts with a virtually complete set of formulas for achieving form in functional discourse.

Professor Minor focuses on visual perception and emphasizes the importance of visual aids in technical writing.

Professor Andrews provides a brief guide to discussing visual techniques of presentation in technical writing classes.

Professor Pearsall approaches the topic from the viewpoint of curriculum development and provides suggestions for structuring a technical communication program.

Professor Rice treats the subject of the consultant's teaching of technical writing with his look at what's right and what's wrong with teaching in the industrial setting.

Technical writing is becoming an increasingly important element in the college curriculum. Technical writing differs from writing as it has traditionally been taught; it is, to use James Souther's words, a discipline in itself and one that can be challenging and rewarding to teach.

Janet H. Potvin
Guest Editor

Cover: *Study of a Flying Machine*, by Leonardo da Vinci, illustrates that the totality of man's achievements are viewed most clearly when, as it is often said," . . . we stand on his shoulders," for then we not only comprehend the present but also transcend the present to look beyond to the infinite possibilities for the human spirit.

It is in the genius of da Vinci that the manifesto for educators lies implicit: the aesthetician, the scientist, and the technologist are interdependent in the struggle for the realization of overarching goals for education that will encompass a whole culture.—E.S.

John A. Walter
University of Texas at Austin

Teaching Technical Writing: Resources and Strategies

The last few years have seen a dramatic increase in the number of students enrolling in technical writing courses and in other practical expository writing courses. At the University of Texas at Austin, enrollment in the introductory technical writing course has doubled in the last few years, the result, in part, of a sizable increase in enrollment in the College of Engineering, which requires most of its students to take not only the freshman course in rhetoric and composition but also the three-hour course in technical writing. But the increase in engineering enrollment does not account for the large numbers of non-engineering students who enroll for the course; we have found that as many as half of the students enrolled are from other disciplines: anthropology, social sciences, nursing. Moreover, the increase in enrollment in technical writing has more than been matched by the startling increase in another of our practical writing courses: a sophomore-level course in expository writing. Just a few years ago, we scheduled two sections of this course and had some difficulty in registering enough students. Now we have about 25 sections, of 25 students each, each semester, and approximately that many of technical writing. And we could have more of each course each semester: staffing problems have compelled us to turn students away.

During these last few years we have seen a parallel decrease in the number of students registering for upper-division literature courses, although our upper-division courses in expository writing have grown considerably in number and enrollment. This state of affairs—and I have no reason to believe it is peculiar to the University of Texas at Austin—has some rather obvious implications for departments of English; they must either identify and employ trained teachers of technical writing (and expository writing)—a difficult task since there are so few colleges and universities with professional training in this field—or they must find means of preparing teachers whose primary expertise is in literature to teach these practical courses. I take it for granted that a sizable number of teachers who have been trained in literature will be willing to add skill in teaching technical and expository writing to their professional qualifications—for self-preservation, if for no other reason.

Do resources exist that will permit the literature-trained teacher to prepare to teach technical writing, short of going to one of the few schools offering professional training? Yes, and it is my purpose in this article to discuss some of them. What I shall have to say makes no pretense of completeness, but I believe I can offer some suggestions that will enable the interested teacher to make a very good start toward becoming professionally prepared. The suggestions fall into the categories of self-help, primarily through reading; attendance at professional society meetings devoted to technical writing; attendance at seminars, symposia, and institutes devoted to the teaching of technical writing; internships; and, if possible, the taking of graduate course work in teaching technical writing.

Before setting down specifics, let me point out that the teacher trained primarily in literature brings a great deal from that training that will be of benefit in teaching technical writing. Quite apart from reading literary works themselves, an experience which surely has led to sensitivity to language—and not merely emotive language—that teacher has also had to do a great deal of reading—and writing, in all probability—in functional prose, prose the aim of which is to convey information. As Reginald O. Kapp wrote in *The Presentation of Technical Information*, "The purpose of Functional English can be stated in a few words. It is always to convey *new* information. The information may consist of all kinds of facts, of inferences, arguments, ideas, lines of reasoning. Their essential feature is that they are new to the person addressed" (New York: Macmillan, 1948). This definition could easily fit many critical articles about literature, or many of the interpretive pieces in professional journals. When the critic writes about imaginative literature, he writes functionally—or at least I like to believe that he does. So I would argue that the typical English teacher's training in literature is not a waste when he or she comes to teach functional writing; far from it, it may indeed give perspective and insight into the subtleties and nuances of meaning that will stand the teacher in very good stead when attempting to help students learn to convey information skillfully and effectively. One of the main difficulties, I imagine, will be the lack of comfort and ease in dealing with the subject matter.

SELF-HELP

Probably the best, and most obvious, way to become acquainted with technical writing is to read: textbooks, collections of articles about teaching technical writing, and actual examples of various kinds of technical writing—reports, manuals, brochures, proposals.

Since the number of textbooks on technical writing is so large (a recent text lists more than 75 in its highly selective bibliography), I will list just a few that I believe will give a good introduction to the subject, as well as some insight into ways in which a course may be structured.

Gould, Jay R. and Joseph H. Ulman. *Technical Reporting*, 3rd ed. New York: Holt, Rinehart and Winston, 1972. *This book is very good on the basics.*

Houp, Kenneth W. and Thomas E. Pearsall. *Reporting Technical Information*, 3rd ed. Beverly Hills: Glencoe Press, 1977. *This is a widely used text.*

Jordan, Stello, Joseph M. Kleinman, and H. Lee Shimberg, eds. *Handbook of Technical Writing Practices*, 2 vols. New York: Wiley-

Interscience, 1971. *This two-volume work, some 1374 pages, is scarcely suitable as a textbook for the conventional course in technical writing, but it is an invaluable storehouse of information for the teacher, covering almost every conceivable aspect of technical writing, especially with reference to the forms and practices in government and industry.*

Mathes, J.C. and Dwight W. Stevenson. *Designing Technical Reports: Writing for Audiences in Organizations.* Indianapolis: Bobbs-Merrill, 1976. *A highly respected text.*

Mills, Gordon and John A. Walter. *Technical Writing,* 4th ed. New York: Holt, Rinehart and Winston, 1978. *I have thrown modesty to the winds in listing a book I co-authored, I suppose, but it is also a widely used text and one held in high esteem by many teachers of technical writing. It employs a rhetorical approach to the subject.*

Pearsall, Thomas E. and Donald H. Cunningham. *How to Write for the World of Work.* New York: Holt, Rinehart and Winston, 1977. *This book may be found particularly useful in the two-year or community college.*

In addition to texts, there also exist some collections of articles on the teaching of technical writing:

Cunningham, Donald H. and Herman A. Estrin, eds. *The Teaching of Technical Writing.* Urbana, Ill.: National Council of Teachers of English, 1975. *This anthology contains not only articles which attempt to define technical writing and what teaching the subject entails but also how teachers teach the course and how they evaluate their students' products.*

Pearsall, Thomas E. *Teaching Technical Writing: Methods for College English Teachers.* Washington, D.C.: Society for Technical Communication, 1975. *This pamphlet (25 pages) gives useful information about what should be covered in a technical writing course, and its bibliography lists some eight bibliographies of use to the prospective teacher.*

Sawyer, Thomas M. *Technical and Professional Communication.* Ann Arbor: Professional Communication Press, Inc., 1977. *This useful book contains articles on teaching in the two-year college, the four-year college, and the professional school. One especially useful piece is Carolyn M. Blackman's "A Bibliography of Resources for Beginning Teachers of Technical Writing." Ten pages are devoted to listing publications on every aspect of teaching technical writing.*

The following books do not deal expressly with teaching technical writing, but are most useful:

Gould, Jay R. *Directions in Technical Writing and Communication.* Farmingdale, N.Y.. Baywood Publishing Company, Inc., 1978.

Gould, Jay R. and Wayne A. Losano. *Opportunities in Technical Writing Today.* Louisville: Vocational Guidance Manuals, Inc., 1975.

Sparrow, W. Keats and Donald H. Cunningham. *The Practical Craft: Readings for Business and Technical Writers.* Boston: Houghton Mifflin Company, 1978.

Balachandran, Sarojini. *Technical Writing: A Bibliography.* Urbana-Champaign: American Business Communication Association and the Society for Technical Communication, 1977. *This annotated bibliography is 147 pages.*

Finally, the Society for Technical Communication, in its anthology series, publishes collections of articles on such subjects as teaching technical writing (in-house programs), writing technical articles, proposal writing, and technical editing. Complete information about these publications may be obtained by writing to the Society at 815 Fifteenth Street, N.W., Washington, D.C. 20005. The Association of Teachers of Technical Writing has also published some useful anthologies: *Teaching Technical Writing: The First Day in the Technical Writing Course* (ed. Merrill Whitburn) and *Teaching Technical Writing: Cassette Grading* (ed. Charles R. Stratton). In process are two more: *Training of Technical Writing Teachers* (ed. John Harris) and *Teaching Audience Analysis* (ed. Paul Anderson). Additional anthologies are projected. More can be learned by writing to Donald H. Cunningham (Editor, *The Technical Writing Teacher),* UPO 685, Morehead State University, Morehead, Kentucky 40351.

Although reading all or part of the items mentioned above can go a long way toward preparation to teach technical writing, there are additional possibilities. One is to audit a technical writing course taught by an experienced teacher. Some schools (Brigham Young, for instance) require prospective teachers to attend a course for a semester before undertaking a section of their own—regardless of rank. It's a good way to learn. Another is to visit a technical writing/editing department in a local company. Having an opportunity to observe at first hand just what goes on in a technical publications department is an invaluable training aid. A final way is to write to companies and ask for examples of the kinds of writing done by their technical people. Professor Mills and I found it immensely helpful to study literally thousands of documents before we undertook to write our book on technical writing.

PROFESSIONAL SOCIETIES AND TECHNICAL WRITING

Yet another way of enhancing knowledge of technical writing and how to teach it is through joining professional societies devoted to technical writing, attending and participating in the annual meetings, and reading the society publications. I will list these in the order of their importance to the teacher of technical writing:

(1) The Association of Teachers of Technical Writing (ATTW). Established seven years ago, the Association now has approximately 800 members. Membership dues include subscription to the thrice-yearly publication, *The Technical Writing Teacher,* a journal devoted entirely to the teaching of technical writing. Most of the articles in *The Technical Writing Teacher* are specifically aimed at providing the reader with new ideas and methods for teaching a successful course. In addition, as noted above the Association has begun publication of a series of anthologies on various aspects of the teaching of technical writing. So far ATTW has not held annual meetings on its own but has met concurrently with the Conference on College Composition and Communication (CCCC). Information about membership may be had by writing to Nell Ann Pickett, Secretary-Treasurer, Hinds Junior College, Raymond, Mississippi 39154. Currently I am President of this Association.

(2) Conference on College Composition and Communication (CCCC). For some years now, this organization has programmed a number of papers on technical writing at its annual meetings. It is a satellite organization of the National Council of Teachers of English (NCTE). Articles on the teaching of technical writing appear from time to time in its quarterly, *College Composition and Communication,* as well as in NCTE's *College English.*

(3) Society for Technical Communication (STC). This society was established, in the mid 1950s, primarily for persons professionally engaged in technical writing, editing, illustrating, and production; a good many of its members, however, are teachers and its quarterly publication, *Technical Communication,* often carries articles of interest to the teacher of technical writing. Moreover, its annual conference always devotes a considerable part of its program to education. Information about membership may be had by writing to Curtis T. Youngblood, Executive Director, 815 Fifteenth St., N.W., Washington, D.C. 20005.

(4) American Business Communication Association (ABCA). This society's publication, *Journal of Business Communication,* often prints articles on the teaching of technical writing. Information about membership and publications may be had by writing to ABCA, 317-B David Kinley Hall, University of Illinois, Urbana, IL 61801.

(5) Modern Language Association (MLA). For the last several years, MLA has devoted a portion of its annual program to technical writing. Speakers have usually been prominent in the field. Many of the papers have been published in the *Journal of Technical Writing and Communication*, edited by Jay R. Gould and published by Baywood Publishing Company, 43 Central Drive, Farmingdale, NY 11735.

Additional information about societies, organizations and meetings devoted, at least in part, to technical writing may be found in Carolyn Blackman's article in Thomas Sawyer's *Technical and Professional Communication* cited earlier.

INSTITUTES, SEMINARS, AND WORKSHOPS

Many colleges, universities, and professional societies now offer institutes and workshops on the teaching of technical writing, which provide helpful, intensive training. Some of the better known programs include:

(1) Rensselaer Polytechnic Institute's Technical Writing Institute for Teachers. Directed by David L. Carson, this five-day institute employs a staff of prominent teachers and gives training in all aspects of technical writing, including sessions on such topics as the history of scientific and technical writing, applications of rhetorical theory to technical writing, audience analysis, graphic arts, writing in industry. Information may be had by writing to the Office of Continuing Studies, Rensselaer Polytechnic Institute, Troy, NY 12181.

(2) The University of Michigan's Teaching Technical and Professional Communication Conference. Headed by Professors J.C. Mathes and Dwight W. Stevenson, this five-day program is one of the best known. Information may be obtained by writing to the Conference Coordinator, Department of Humanities, College of Engineering, The University of Michigan, Ann Arbor, Michigan 48109.

(3) NCTE Pre-Convention Three-Day Workshops. For several years now, NCTE has sponsored on occasion three-day, intensive training in the teaching of technical writing, making use of the services of well known teachers of the subject as its staff.

Still other workshops and institutes will be found announced in the pages of *The Technical Writing Teacher* and the *Journal of Technical Writing and Communication*. Also worth mentioning is the fact that many institutions (and professional societies) offer workshops on technical writing, usually through continuing education. Designed primarily for practicing engineers and scientists, such workshops may nevertheless prove quite useful to the teacher of technical writing.

INTERNSHIPS AND GRADUATE COURSES

Thomas E. Pearsall and Frances J. Sullivan in their STC publication entitled *Academic Programs in Technical Communication* (1976) name six institutions that offer either an M.A. or M.S. in technical communication: Boston University, California State University at Fullerton, Illinois Institute of Technology, University of Minnesota, Oregon State University and Rensselaer Polytechnic Institute. All but one of these schools offer a work-study program or internship in conjunction with the academic programs.

Still other institutions offer some graduate work in technical writing. At the University of Texas at Austin, we give one graduate course in the teaching of technical writing and a number of closely related graduate courses in rhetoric and communication theory. We are in the process of instituting an internship program in connection with the graduate course in technical writing. The internship would require the student to arrange for employment in the technical publications department of a cooperating company; the student would then devote a semester or summer to full-time work as a technical writer/editor, at the same time selecting a faculty member as his supervisor and registering for the graduate course in teaching technical writing. During the internship, the student would submit periodic interim reports and a final report to his faculty supervisor.

STRATEGIES FOR TEACHING TECHNICAL WRITING

So far I have emphasized resources that will lead the beginning teacher to individual strategies for teaching a course in technical writing. I doubt very much if any experienced teacher of technical writing believes he or she has arrived at final, definitive answers to the question of how best to teach. Most, however long they have been at it, are eager to share ideas, plans, projects, and models of assignments with others who share interest in the subject. To that end, Elizabeth Harris in our department has put together a resource book, copies of which are made readily available for all who teach our technical writing course but especially for those who are new at it. An outgrowth of a semester-long symposium on technical writing, the resource book contains a wealth of materials—lesson plans, reprints of articles on a philosophy or theory for the course, and suggested assignments teachers have contributed on a wide variety of topics: style, organization, rhetorical modes, various report types, letters, and the research report. Not only does such a resource book provide models to follow but it also helps to generate new ideas and plans.

As I wrote in "Confessions of a Teacher of Technical Writing," which appeared in the first issue of *The Technical Writing Teacher* (Fall 1973), pp. 3-9, and is anthologized in Cunningham and Estrin's *The Teaching of Technical Writing*, "a basic course in technical writing should aim to guide students toward the acquisition of skill in practical communication; specifically . . . facility in writing business letters, various kinds of basic types of exposition peculiarly pertinent to engineering and scientific reports, some common kinds of reports, and a long library research report. More generally, and accompanying the above, I try to familiarize the students with the requirements of acceptable style in technical writing, with problems of organization, with problems of writing introductions, conclusions, and transitions, with standards of acceptable format, with some elementary graphic aids, and with the skills involved in finding and using published information. If time permits, I also try to give students some experience in making oral reports (usually on some phase of the research they are doing for a long paper)."

In conclusion, I believe that the use of the resources I have mentioned—and the strategies they will lead to—will go a long way, perhaps the entire way, toward transforming the teacher of literature into a competent teacher of technical writing.

James W. Souther
University of Washington

What's New in Technical Writing

A new and significant dimension being experienced in technical writing is its increasing acceptance as an approach to the teaching of writing on campuses across the nation. Only a few years ago, composition was a required subject on campuses across the country. Then the widespread requirement suddenly began to disappear. Today, writing courses are experiencing a revival on campus, and interestingly enough, they are coming back in good part as applied or technical writing. Of course, all of this means an increase not only in the number of courses but also in the number of teachers finding themselves in classes of technical writing.

The material available to the new teacher of technical writing is much better today than that available to me some 30 years ago. I had never heard of technical writing when I was thrust into the classroom. I certainly was not prepared to teach it, and as I was soon to discover, neither were those who sent me into that classroom. Technical writing is no longer an unexplored field: the teacher needs but to turn to those who have explored the field for information and guidance. At the University of Washington, for example, we offer 1- and 2-year teaching appointments to English graduates interested in gaining guidance and actual experience in teaching technical writing.

A substantial number of new teachers are entering the field each year yet I wonder if they are really interested in technical writing. Are they willing to accept the challenges it offers to many of their traditional writing concepts? What are their views and feelings about science, technology, business, and the corporate world? Are technical and business writing simply becoming new names for traditional merchandise?

At the last NCTE meeting, I had an experience which I suspect is rather representative. A young man asked a question of our panel: "If," he said, "I teach a good, solid writing course that places some emphasis on the reader, have I not taught the equivalent of a technical writing course?" I have no doubt that the young man who raised the question teaches an excellent writing course and that he sincerely believes that it is basic to all writing. Yet I strongly suspect that as good as his course is, it falls considerably short of being an effective substitute for an equally good technical writing course.

In this article, I would like to share some of the transitions and adjustments new teachers of technical writing face and the challenges and satisfactions that await them.

1. *Attitude toward science, technology, and business.* The teacher who is strongly anti-science, anti-technology or anti-business will find teaching technical or business writing not only difficult but distasteful. Many humanists have such views, and I am not suggesting that they change, only that they recognize that such views can be detrimental to effective teaching in technical writing classes.

2. *Traditional approach to the teaching of writing.* The teacher who moves into a technical writing class and proceeds to teach a traditional writing course will not be very successful. Of course, sound writing principles apply: they apply to all writing, even fiction. Technical writing, like fiction or journalism, is a separate discipline, a unique kind of writing. Technical writing courses must reflect the unique difference as well as traditional rhetorical principles. The old cannot pass for the new. As important as the principles are, there is more to technical writing than clear sentences and well wrought paragraphs.

3. *Writing in a vacuum.* Writing courses are too often taught in a vacuum: no purpose, no reader, no communication situation, just classroom exercises. Communication is not achieved just by writing; the work must be read and comprehended too. More than one person is involved. Writing in the world-of-work never takes place in a vacuum: it always has a purpose and a reader, and it is always situational with the situation having impact on the writer and the writing. So it is necessary to bring the context, the situation into the classroom for every assignment.

4. *Choice of topic.* Whenever I review a new book on writing and find the author discussing "how to choose a topic," I know that the book is not in tune with the real world or at least with the world-of-work as I see it. As Associate Dean, I seldom write about a topic that I choose, but I often write about subjects that my Dean chooses. Technical and business writing grow out of work assignments and individual and institutional needs for information and judgments. Such communication tends to focus on information transfer, not on personal development. Essays seldom survive outside the classroom.

5. *Readers read it all.* Too many traditional teachers teach as if they believe that readers read everything in its entirety. But that may be more the exception than the rule. It is true of much creative writing; it may also be true of much correspondence. But it is not true of newspapers, magazines, reports, instructions, manuals, and technical documents. Readers dip in, get what they want, and then leave. Busy readers in the world-of-work approach writing in terms of "Do I read, route, or skip it?" The last two are highly preferred. Further, when readers seek specific information, they often read but a part of what is presented. Instructors need, then, to teach students to structure writing according to the reading habits of differ-

ent groups. They need to teach a more sophisticated view of organization, of sectioning, and of layout than is usually done in traditional writing courses. For example, technical writing requires an overall framework or organization which then contains a variety of other organizational patterns. As a result, not one introduction but many are needed: at least one at the beginning and one at the start of each main section. Titles and subtitles are also needed to make parts easily accessible, to make quick reference and high-focused reading possible. Students must learn to structure writing for their readers.

The challenge of technical writing is to be functional, to be effective, to have an impact. An effective piece of technical writing accomplishes something. It helps someone. It influences decision-making. What then should be included in a technical writing course? What should the content and emphasis be?

1. *Technical writing should focus on the reader.* The reader is the focus in technical writing, but this focus includes more than the "level of the reader" taught in traditional writing courses. Level is only the beginning; more important is understanding the "reader's informational needs." If a report does not meet those needs, it fails. If a brochure on a student financial aid program does not provide the students with the information they need, it fails. An impact statement that does not provide sufficient coverage and depth of the potential impact on our environment does not serve the decision-making process. The role of the reader, the action to be taken because of the reading, or the decision to be made, are important in technical writing. Effective writers understand the level of preparation, experience and interest of their readers; more than that, however, they recognize the role of their readers in the decision-making process, and they meet the information needs of their readers.

2. *Technical writing is always situational.* Technical writing is highly situational, always having a specific purpose and a particular use. It must be directed toward specific readers or groups of readers. If a report is to be used as a basis for public discussion, it must be structured for that use; if it is to provide a program of action, it needs a special organization and layout. If the report is to serve as a staff reference, it requires a different structure and form. Not all documents are used the same way or for the same reasons, and technical writing classes must equip students to react to different use requirements and to specific situations.

3. *Layout is an important communication tool.* In technical writing, form and layout are important tools for making readers see certain parts of what is written. Form and layout give unity, emphasis, and coherence to the writing and aid understanding. Yet most traditional writing courses in concentrating on language entirely neglect these important communication tools.

4. *Graphical and statistical presentations are an integral part of communication.* Technical writing is often quantitative as well as qualitative, emphasizing information and its meaning. Numbers are important to accuracy; consequently, technical reports often make use of illustrations and tables. Students must be instructed in how, when and where to use these tools. But even more important, students must be made aware of what guidance the reader needs in order to integrate graphic and statistical information with the verbal presentation.

5. *Relationship of generalization to detail is significant in technical writing.* Because the content of technical writing comes primarily from science, technology, and the social sciences, close attention to detail and accuracy are especially important. Numbers, statistics and mathematics are commonplace. Consequently, the relationships between the detail and the generalizations based on it are especially significant. Students must be taught how to support generalization with detail, and to clearly express and emphasize the relationships if their reports are to be useful. Often, such relationships are the key to understanding in information transfer.

6. *Technical writing is often written to specifications.* Most scientific and technical writing, whether in business, industry, government, or education, results from assigned work. Frequently, such writing must be done according to specifications laid down by others: a customer, a government agency, a foundation or even one's own organization. Whatever the source, such specifications are one more constraint with which students must be prepared to cope. Consequently, classes should include some experience in writing to such constraints.

7. *Functional writing requires a careful examination of the writer's assumptions.* Perhaps the most challenging aspect of teaching technical writing is to see students begin to identify and clarify the assumptions that underlie their writing decisions. Writing is a process that demands constant decision-making. As students face their assumptions, examine them, understand their significance to their writing, then students gain control over their communicative skills.

If teachers of writing are to serve students and to serve them well, they have the responsibility of making what is taught have an impact on students' writing skills and habits. In addition to providing students with a knowledge of writing principles and use of language, the teacher of technical writing must provide them

1. with a knowledge of *how to go about the task of writing*, with a knowledge of the writing process. For that is the constant in their writing experience; the product is always different;
2. with a knowledge of *what questions to ask about each writing situation* (purpose, use, reader); and
3. with a knowledge of *which writing decisions are impacted by the answers to those specific questions.*

If students know that *purpose* influences selection of content, organization and emphasis, then they can make decisions in these areas of their writing.

If students know that *use* influences organization, form, layout and the physical characteristics of their writing, then they can make these decisions.

If students know that the *reader's* level of preparation and experience, informational needs and decision-making role influence level of presentation, selection of content, order of presentation and emphasis, then they can make the writing decisions.

To the extent that instructors can relate their teaching of writing to the specific writing decisions students must make, to that same extent shall they have succeeded. The closer assignments and courses match the real-world communication situation, the greater the interest, the challenge, and the satisfaction for both student and teacher.

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Technical Communication: The Persuasive Purpose

Perhaps the most important technical communication is inherently persuasive rather than merely informative. Yet most discussions of technical communication do not sufficiently distinguish between these two purposes, and thereby fail to alert writers of technical communication to their purposes for writing. The failure of engineers, managers, administrators, and other professionals to appreciate the persuasive purpose of much of their technical communication can cause serious problems within their organizations, and for other institutions and the public as well. Any professional first of all must develop an appreciation of the persuasive purpose of much technical communication.

TECHNICAL COMMUNICATION IS INHERENTLY PERSUASIVE

Technical communication is inherently persuasive when the writer's purpose is to make something happen in an organization. The writer of a soils test report, for example, uses her analysis of the compressibility ratio of the soil to enable the contractor to install the pilings for a die casting plant foundation. The writer of a staff performance evaluation uses the analysis of steno-pool functions to enable Medical Records to centralize some of its services. Any organization continues to function routinely, according to schedule, or in terms of assigned responsibilities until some technical communication effects a change in those operations.

The persuasive element in technical communication results from the fact that most organizational technical communication,[1] rather than being a process of information transfer, is a problem-solving activity. The communication act is part of a problem-solving process essential for the organization to function and pursue its goals (see Figure 1, Technical Communication is a Problem-Solving Activity). The technical communication contains the necessary information and judgments to enable others in the organization to act effectively to change the present state of organizational activities in order to meet a need or solve a problem that had arisen because the present state of organizational activities was not achieving organizational goals or had not yet achieved organizational objectives. The technical writer's purpose is persuasive because the writer, on the basis of his or her professional task, must make certain that those who receive the communication take appropriate actions.

An office supervisor cannot meet the demand for duplication services, and must persuade management to upgrade the facilities. A public health inspector observes that a restaurant kitchen fails to meet the health code, and must persuade her supervisor that enforcement action is warranted. A machine parts inventory stockperson concludes that losses of sheet metal screws exceed production line use, and must persuade foremen to modify production line operations. In short, much technical communication addresses on-going organizational problems and needs in order to improve efficiency, maintain quality, reduce costs, upgrade personnel, and return profit.

There are other purposes for technical communication, of course. There are various informational materials for various publics. There are numerous reports for the file—all types of documentation. There are routine forms to fill in and numerous letters and memos responding to requests for information. But these types of technical communication usually are routine; they often are performed by technicians, clerks, secretaries, assistants and the like. They do not require the professional responsibility of processing and interpreting information in order to reach judgments about actions to be taken and changes to be made.

Professionals in any field—forestry, social work, marketing, public health, engineering—are trained to assume organizational responsibility. When they communicate their purpose is to persuade in order to fulfill that responsibility.

INFORMATION TRANSFER IS NECESSARY BUT OFTEN INSUFFICIENT

Traditional models and texts on technical communication have stressed the information transfer function of technical communication. However, they often emphasize the clear and efficient transfer of information at the expense of the selective use of information for a persuasive purpose. This misplaced emphasis can lead to inefficient communication; the transfer of information usually is the means to accomplish a purpose rather than is an end in itself.

The technical communication model traditionally assumed seems to be a linear, one-way process of information flow. The writer encapsulates a

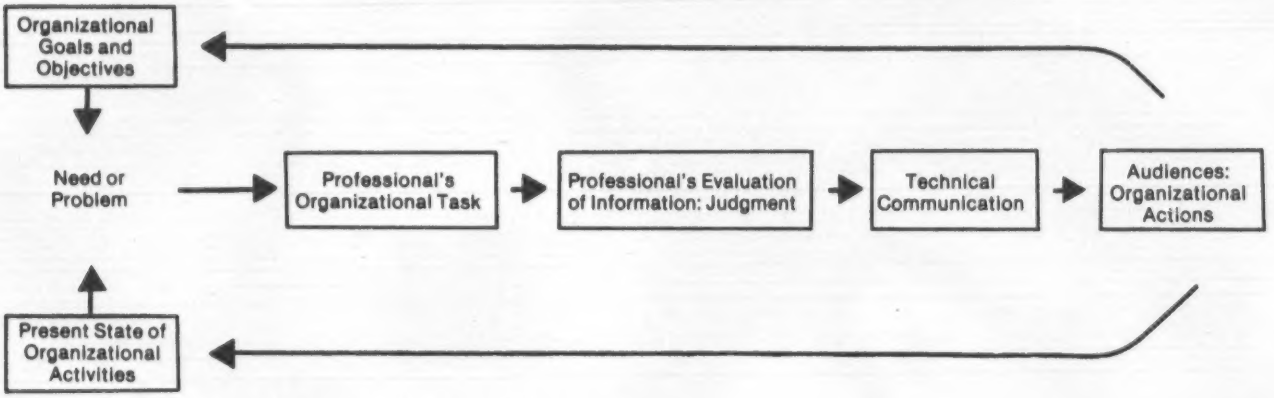

Figure 1. Technical Communication is a Problem-Solving Activity

message in some appropriate form and transmits it to a reader. The assumed model probably is the Shannon-Weaver model of source-signal-receiver, perhaps explained in terms of encoding and decoding.[2] Variations of this model appear in many materials on technical writing.

The source-signal-receiver model accounts for, I think, the usual concern in technical writing for subject matter, format, and style. Subjects such as description of a mechanism, forms such as the progress report, and stylistic characteristics such as clarity and objectivity provide the sources for the skills the technical writer must master. This is a focus on the signal, on technical communication as the transfer of information.

This focus on the content of technical communication is appropriate, of course, for many forms of technical communication. It is appropriate for science writing (e.g., journalism), for instructions and some manuals, for specifications, for research reports, for trade journal articles, for documentation. These types of technical communication often are performed by professional technical writers and editors as well as by the various professionals, engineers, scientists, and managers themselves.

This focus on information transfer rather than on the selective use of information for a persuasive purpose, however, can lead to the neglect of skills important to effective technical communication. For every description of a mechanism in technical communication by the actual professional problem-solver there are, perhaps, ten requests for authorization to purchase a mechanism or recommendations to modify a mechanism. These evaluate a mechanism according to organizational criteria rather than describe what it is and how it is used. A writer who focuses on the description rather than the evaluation will neglect skills of analysis, evaluation, and persuasion important to his or her professional role in an organization.

A test report by an engineer at a truck proving grounds illustrates the need for persuasion rather than just information. A vendor had designed a jack to be used with a new truck model. The test engineer's task was to evaluate the jack for selection as standard equipment with the truck. In this situation the engineer found that the jack was difficult to place properly under the axle, and that therefore use of the jack would result in an unacceptable rate of failure. The truck would fall off the jack—posing problems of safety—or the jack would be bent because of improper placement—posing problems of equipment warranty. The test engineer therefore had to write a test report that would persuade engineering not to accept the jack, and that would provide effective analysis of test results to enable engineering to request redesign of the jack or revise performance criteria for bid purposes. The test engineer did not have to write a report that described the jack or explained how the jack operated. The writer used two sentences to report that "the handle was twisted out of shape after three lifts" because "of the difficulty in placing the jack directly under the center of the axle." Description of the jack before or after use was unnecessary in this report (some reports would use photos for documentation), as was a process explanation of the difficulty of using the jack—placing it under the axle, etc.

In much important technical communication, the need is for the writer to select information for a persuasive purpose rather than just to transfer information to a receiver (audience). The writer in part must select and present information in terms of what actions must be taken, not in terms of the professional and technical activities that form the subject of the report and often serve as the focus of reports that limit themselves to the transfer of information.

TECHNICAL COMMUNICATION REQUIRES JUDGMENT

The role of the engineer, supervisor, manager, or other professional is to exercise judgment in order to meet responsibility in organizational problem-solving processes.[3] They therefore must design their technical communications in terms of the judgments they have formulated during their technical activities. When they fail to use their judgments as the basis for designing their communications they can create serious problems within their organizations. A test report that conveys information on how the jack lifts the truck, although the handle should be strengthened and the cradle redesigned, can result in the jack being accepted as standard equipment when it should have been rejected or required to be redesigned. Writers formulate their judgments in terms of the organizational problem-solving process and use these judgments to determine the persuasive purpose of the report.[4]

Although all teachers of technical writing should make site visits to observe professionals in action, they must be aware of the judgmental responsibilities of those professionals—the distinctive

element in any managerial, supervisory, or professional role but an element that often cannot be directly observed. Most college-level programs are training students to assume responsible roles in organizations. Even though initial and middle career positions are not necessarily management positions, persons are in those positions to assume responsibilities and make judgments. A probation officer for the municipal court routinely has to evaluate her cases and advise the court; a forester has to evaluate clearing and reforestation plans for his supervisor; an industrial engineer must evaluate a management suggestion to use an industrial robot to do spot welding on the assembly line. Even technician programs often are training students to assume responsibility.[5] A fireman's fire inspection report, though often short and seemingly routine, has an important implicit persuasive purpose because it is used for insurance purposes and may be significant evidence in court.

Awareness of and concern for his or her responsibility therefore should be an important concern of the writer of technical communication. This sense of responsibility first manifests itself when the professional analyzes his or her results and formulates judgments. It then should be in the forefront of the writer's concern as he or she identifies the various audiences for a report, determines the purpose of the report, and selects and organizes material in the report.

A professional who concentrates on the transfer of information rather than exercises judgment to write a persuasive report, either implicitly or explicitly, could well fail to fulfill his or her professional responsibility. The Presidential Commission investigating the accident at Three Mile Island uncovered a serious failure in technical communication.[6] Memoranda within Babcock and Wilcox during the year prior to the accident had warned that a premature shut-off of emergency cooling pumps could lead to serious problems.[7] The Manager of the Plant Integration Department at Babcock and Wilcox testified about one important memo that informed him that action had not yet been taken although earlier memos "suggest the possibility of uncovering the core if present HPI [high pressure injection] policy is continued."[8] He said, concerning this important memo, that "I recall glancing over it very quickly and keying on the two specific questions. I do not recall reading it very carefully at that time . . . . I remember thinking that they were rather routine questions . . . . I then, just that quickly, disposed of this piece of paper crossing my desk."[9]

Had the manager responded to this memo, the accident at Three Mile Island might well have been prevented. His failure to respond in part seems attributable to the informational rhetoric of the memo. The subject line, "Operator Interruption of High Pressure Injection," is descriptive rather than an imperative to action; it also is the same subject line of the two previous memos on the problem. The memo proceeds to discuss the recommendations to change operating procedures in the two previous memos, suggests further evaluation to determine the side effects of the recommended changes, and states that Nuclear Service has not yet notified operating plants. It closes with the "request that Integration resolve the issue of how the HPI system should be used. We are available for help as needed." [10] The manager did not respond to this request; as he testified, he instead keyed "on the two specific questions" and thought they were "rather routine."

Rather than end with the request, the memo should have been designed from the outset with the writer's judgment dominant, with the request becoming a persuasive report to change the organization's present operating procedures or resolve the expressed concerns. It instead essentially fails to distinguish between previous recommendations and current questions and requests, and at most seems to expect further investigation and analysis. A busy manager, however, might well quickly dispose of such a memo that in structure and tone seems explanatory and informational—almost a status report—rather than is persuasive in structure and tone.

The hearing also identified weaknesses in the communication process within Babcock and Wilcox as well as in the rhetoric of specific memos. The casualness of distribution lists was queried by the commissioners, and the lack of feedback loops was stressed. In sum, the hearing disclosed that both writers and the communication process within Babcock and Wilcox were not oriented to the persuasive function of technical communication, which emphasizes that the writer must design his or her reports to make certain that those who receive the reports take the necessary and appropriate actions.

THE RESPONSIBILITY TO EFFECT CHANGE

Effective technical communication occurs when the writer establishes the specific purpose of a memo or report, and writes accordingly. The writer analyzes the technical information, evaluates relevant organizational activities and problems, and uses his or her judgment to define the specific purpose of a particular communication. The purpose is to effect change in the organization—to get persons to act, to change their minds, to change their activities.

When writers accomplish their purposes, they fulfill their responsibilities as employees and professionals. Technical communication therefore bears this imperative to assume responsibility. It is the premise from which both teacher and writer must start.

END NOTES

[1] I introduce a model for a subset of the types of communication usually subsumed by the term, "technical communication." This subset might better be labelled, "organizational communication." In my judgment, in terms of quantity and importance, most of the job-related communication persons perform can be classified as organizational communication. Organizational communication probably is the prevalent form of written communication in our society and therefore what most college graduates must spend considerable time doing.

[2] David K. Berlo, *The Process of Communication* (New York: Holt, Rinehart and Winston, 1960), is particularly appropriate.

[3] I distinguish between the roles of the professional who must communicate and the technical writer in a technical publications department.

[4] An algorithm that enables a writer to use these judgments to formulate the persuasive purpose of a report is presented in J.C. Mathes and Dwight W. Stevenson, *Designing Technical Reports* (Indianapolis: Bobbs-Merrill, 1976), Chapter 3: "The Problematic Context."

[5] The communication responsibilities of technicians and para-professionals are discussed in Ingrid Brunner, J.C. Mathes, and Dwight W. Stevenson, *The Technician as Writer* (Indianapolis: Bobbs-Merrill, 1980), Chapter 1: "The Technician on the Job."

[6] *Transcript of Proceedings*, President's Commission on the Accident at Three Mile Island, Public Hearing, July 19, 1979, p. 248.

[7] *Transcript of Proceedings*, Commission Hearing Exhibit No. 3 (9 Feb. 1978); Commission Hearing Exhibit No. 4 (16 Feb. 1978); and Commission Hearing Exhibit No. 5 (3 Aug 1978) are three important memorandums.

[8] *Transcript of Proceedings*, Exhibit No. 5.

[9] *Transcript of Proceedings*, pp. 240-241.

[10] *Transcript of Proceedings*, Exhibit No. 5.

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Perspectives on Time and Space in Technical Writing

Technical writing provides the communication arts with a virtually complete set of formulas for achieving form in functional discourse. Pick up any competent technical writing manual—and there are many—and the text will move inevitably from simple exercises in analyzing the parts of a Zippo lighter or ballpoint pen to definitions of carburetors, descriptions of printed circuits, and formulas for cement. Technical writing is about *things*. It is scientific, mechanical, typically deals with the visible, and is always empirically manageable. It is masculine, logical, left-brained, and it is prospering for the same reasons that accounting and computer science are prospering: it is an indispensable tool for furthering business and technology.

Ask a chemist and engineer about their attitudes toward technical writing, and they will undoubtedly agree that its forms accurately reflect the ways we think and communicate. Technical writing, they may argue, is ideally suited to treat empirical evidence, such as is found in the statement, water does not run uphill. But ask the graphic and performing artists about their attitudes toward technical writing, and they will assert that it is too frozen, too reductionistic, and that its forms cannot accommodate the workings of the creative mind. They will argue that truth, like art, lies on a higher plane than fact, and declare, along with any good Sufi, that it is certainly true that water does not run uphill; on the other hand, if the sea-water did not rise into the sky, where would the garden get its life?[1]

The artist and the scientist in such a debate are only continuing a long tradition in their assessments and "feelings" about subjective and objective reality. It would seem that the issue could be resolved by stating that the artist, when required to verbalize, will essentially be interested in expressive discourse, and the scientist in referential discourse. It would follow that the arts have their functions and the sciences theirs. But the issue—centering on our most fixed form of referential discourse—is not quite so simple, for scientists with excellent verbal and analytical skills admit to a deep-seated frustration when trying to accommodate their perceptual experience to the forms of technical writing. They consistently admit to experiencing conceptual disjunction between apprehension and expression. Accustomed to believing that the fault lies in themselves, in their own insufficient control over the procedures of logical inference, they defend scientific writing on utilitarian grounds and usually conclude, well within the expressive mode, that they seem to have no talent for writing.

The source of the discomfort the scientist experiences, however, is real. Teachers of technical writing usually explain the problem by stating that the scientist's sense of frustration, like the artist's when subjected to objective systems, stems from the total suppression of voice in the effaced point of view, which means that the scientist must forego any sense of engagement with the subject and must view the self, if at all, in the third person—in the persona of "other." But suppressing person, presence, and emotion in technical writing does not account for the scientist's discomfort, any more than it accounts for the artist's. Rules and conventions in style, structure, and purpose are effects, not causes. The discomfort occurs at a deeper level, in the ways all human beings commonly perceive experience and the quite different ways referential discourse is formally arranged to express it. The division lies in two modes of perceiving time and space: one that is scientific, external to experience, and that must be learned; the other that is inherent and biological, and instinctive. The scientist, unlike the artist, is caught in the dichotomy that exists between the two systems, and the dichotomy appears most clearly when the mind, operating according to the experiential time/space system, must shift to another—the scientific—and reconceptualize the same material according to the second system.

Largely unaware that they must accommodate both time-space systems to perceive, analyze, and record their perceptions, scientists typically believe they ought to be satisfied with technical writing because its forms are conceptually compatible with scientific investigation. Like a good pair of shoes, technical writing consists of molds with varying degrees of plasticity into which the content of scientific and technological inquiry may be nicely shaped and expressed. The reason for this nice fit—and the source of the scientist's discomfort—is that technical writing and theoretical reasoning depend upon the same assumptions: that all shape is determined by a framework of three spatial coordinates, and all movement is determined by the linear dimension of clock time. Every thing or event is automatically measured by the empirical indices of Cartesian space and externally imposed clock time. According to such a system, any whole is equal to the sum of its parts. For example, a carburetor will necessarily consist of, and only of, its parts. Conversely, the components of a carburetor, correctly assembled, absolutely do result in a carburetor. The forms of technical writing, based upon identical analytical assumptions, would then seem to provide an ideal means of integrating form and content; for technical writing, dependent for its being on the coordinates of Cartesian space and clock time, is developed in consciously measured and divided sequences, and its validity is tested and evaluated according to its conformance with objective measurement and logical inference.

Experiential perception, however, common to all human experience, uses time in a special and quite limited sense, and space in systems independent of,

and more comprehensive than, Cartesian coordinates. Human perception interprets reality by means of experiential or psychic time and by psychological space systems. It is the perception used by the arts in which all events are subsumed into spatial configurations and all space is perceived as dynamic. Perceptual time and perceptual space, described at length in Gestalt psychology, result in a quite different conception of analysis, which is that the sum of the parts always equals less than the sum of the whole. The artist will always assert that a painting consists of more than any division of its parts and that the experience of a sonata always amounts to more than its three-part exposition, development, and recapitulation. Quite simply, paint does not make a painting; musical notations do not make music; and patterned rhyme and meter combine in ways to make yet something else: poetry. Paradoxically, the artist's higher "truth" lies in the belief that Cartesian space and time, as methods of analysis, ignore structure while the artist's gestalt perception respects it.[2] Music and visual art, for example, are experienced only as analogues to space and time, and to try to express apprehension of perceptual or creative experience by means of Cartesian space and clock time is to experience the agonies of Chinese foot binding. Form and content simply do not fit.

In day-to-day living, and in creative scientific thought and synthesis, the scientist experiences the same perception of time and space as does the artist engaged in holistic creative intuition. But unlike the artist—who never attempts to express the perception of one system by means of the other—the scientist must process understanding, gained in perceptual time and space, through an intellectual time/space system that is essentially independent of the experience. The schizophrenic discomfort the scientist experiences over and over is that of trying to override the ways all human beings commonly perceive experience and to enforce artificial structures on the mind's natural and ongoing apprehension of time and space. The experience results in disjunction and often in the inability to transfer knowledge into communication. When understanding cannot be transferred from one system to the next, then writer's block occurs. It is common in all writing, but potentially extreme in technical writing. The conflict explains in part the many set forms so prevalent in technical writing that, in their linear specificity, attempt to program knowledge, which has no time reference, into linear statement.

All writers might very well profit from consciously recognizing the time-space framework of their ideas, realizations, and apprehensions before they attempt to draw them forth and express them in a different conceptual medium. They might better handle the formal structures of chronology if they knew that, unlike our general assumptions, the human mind seems to be unaware of time except under special circumstances. Time is not a normal component in our experiencing of events.[3] Rather, we are aware of temporal succession only as a continuous unfolding of motion. When the carburetor functions in harmony with the engine, or when we watch someone get up, cross the room, and return with the evening paper, the experience is perceived in a manner similar to that of the non-temporal succession of the alphabet, or of watching a waterfall, or the downward drift of autumn leaves. We are normally conscious only of sequence and orderly succession, and our apprehension finds its correlative in the dance and in music. We are not normally conscious of time.

We do not make conscious reference to time, that is, until our sense of orderly progression is broken, as when silence suddenly replaces noise, or when the carburetor malfunctions. Time is then experienced as an extra component that enters the essentially spatial dimensions of awareness. We become aware of time when events have placed on them specific limits, for example in the rush to finish an examination, or in the ticking of a bomb. Boredom also triggers the intrusion of time into human awareness, as when we have waited over-long in line, or when a concert is badly performed, or when we must perform a task about which we have no interest, such as the repair of a broken carburetor. It finally becomes conspicuous that the mind is aware of time only in stress—when we experience fear, boredom, or deadlines—and the implications for transferring normally spatial experience into chronologically arranged sequence may also account for writer's dread, and for the aversion the artist experiences for technical writing. The artist's felt truth is holistic; the scientist's intellectualized truth is analytical.

The mind, then, normally experiences events only as orderly sequence and within the framework of the dynamics of movement. But when the mind turns from succession to contemplation, it apprehends sequence in simultaneity. We experience memory or creative insight in synthesis, as a simultaneous whole. In other words, we experience it spatially. Here lies the writer's greatest problem: to translate spatial apprehension into externally ordered clock-time sequence. It is no wonder that the artist contends that analysis dismembers and dissects, and no wonder also that technical writing functions efficiently only when it is concerned with describing man-made processes and things within the time-space dimensions of a conceptually man-made universe, for the purposes and procedures of technical writing function independently of nature and the experiencing mind.

Finally, we can understand the differences between scientific and intuitive space when we remember that Cartesian space normally constructs three

dimensions about a static point. The mind, on the other hand, makes reference to space only in terms of the subject contemplated. Space in the mind is therefore constantly shifting and has no reference point except in the context of the subject being apprehended. Further, when more than one subject enters the mind's spatial field, two perceptual space systems come into existence, and both are then contemplated within the framework of yet a third. Space, then, is apprehended in the human mind not as static but as dynamic. It is always shifting and has no reference point except its own. Experiential space actually seems to approximate the four-dimensional world line of Einstein relativity rather than the fixed and measurable dimensions of time and space common to conceptualizing and expressing matters pertinent to business and technology.

Any good Sufi knows that to boil water you need an intermediary—the vessel. Technical writing is not an appropriate vessel for the cosmic departure and return of the rain that waters the garden and stimulates the poet. But it is an appropriate vessel for the sciences, and the technical writer may find new freedom in realizing the larger and different references that pertain to the mind's function and in the realization that conceptual frameworks find their being in rather direct proportion to the nature of the information and experience to be expressed. Technical writing is like the water that does not flow uphill, but, rather, grows still in the equilibrium established between mass and gravity, in the fixed points of scientific time and space. As such, its forms are functionally appropriate, and make good molds and vessels.

END NOTES

[1] Indres Shah, "Meditations of Rumi," in *Caravan of Dreams* (New York: Penguin Books, 1972), pp. 79-80. See also chapter, "Contemporary Sufism," in *The Nature of Human Consciousness*, ed. Robert E. Ornstein (San Francisco: W.H. Freeman, 1973), pp. 275-308.

[2] The content that follows is especially dependent on the writings of Rudolf Arnheim. See in particular his "A Stricture on Space and Time" in *Critical Inquiry*, 4, No. 4 (Summer 1978), 645-57. See also *Art and Visual Perception* (Berkeley: Univ. of California Press, 1974), with special reference to "Space," pp. 218-303, and "Movement," pp. 372-410.

[3] For the concept of the analogue between clock time and virtual or experiential time and duration, see Gordon Epperson, *The Musical Symbol: A Study of the Philosophic Theory of Music* (Ames: Iowa State Univ. Press, 1967); *Aspects of Time*, ed. C.A. Patrides (Manchester: Manchester Univ. Press, 1976); and *Problems of Space and Time*, ed. Paul Edwards (New York: Macmillan, 1964).

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Visual Aids in Technical Writing

"It may be that metaphorical language and mental images such as Einstein's are keys to spurring the mind . . . ."

Visual aids in technical writing have not received the emphasis they deserve: too often visuals are considered secondary parts of a text, useful only for supplementing evidence and information carried primarily in words. They are not generally looked on as an essential part of a written work and especially not as *the* essential component.

Even to discuss words and visual aids as two distinct textual components may be misleading, however. We assume that drawings and sentences are essentially different because they are so obviously unlike in a printed text. We *read* words, sentences, paragraphs, sections; we *look at* graphs, drawings, photos, charts. But the distinction between reading and looking at verbal and visual materials applies only to unperceived text; once perceived, materials must be discussed not by their form, but by their effect on thinking. The distinction between verbal and visual materials then becomes tenuous, suggesting that both kinds of materials likely contribute to a third kind of thinking—a nonverbal, nonvisual way of making discoveries and reaching conclusions. To see how such might be so, it is necessary to review some recent biological discoveries about the human brain.

A BIOLOGICAL MODEL OF THE MIND

It is well known that the brain is formed in two interconnected hemispheres; it was more recently discovered from studies with split-brain patients that the two hemispheres, when separated, can function as essentially independent minds, each "having its own separate and different perceptual experience, with both being conscious simultaneously and in parallel."[1]

We can say then that we do not have a mind of our own, but minds of our own, a fact generally unrealized because of the hemispheric interconnection which serves to transmit sensory information to the correct hemisphere. The split-brain patients had difficulty in matching faces and names, "presumably because the two were processed in separate hemispheres" (1:217), and the mind could no longer integrate the differently processed perceptions.

Further study revealed the functions of the hemispheres: the disconnected left hemisphere, which processes information from the right hand and the right-half visual field in right-handed patients, does "essentially all the talking, reading, writing, and mathematical calculations . . ." (1:212), and is "the superior and dominant brain for verbal communication, linguistic and numeric processing, sequential and analytic thinking, for conceptual symbolic recording, and for directing motor activity in general" (1:218).

The right hemisphere, "essentially mute, alexic, agraphic, and unable to carry out calculations beyond simple additions to sums under 20" (1:212), is

"the superior and dominant brain for perceptual recognition of faces and of nondescript figures as whole patterns, and for dealing with spatial and part-whole relationships, for nonverbal thinking and for direct perceptual transformation . . . " (1:220). Mechanically, the right brain is a directing force in "geometry, drawing, sculptural and mechanical ingenuity . . . " (1:218); inwardly, the right hemisphere "senses, perceives, thinks, and feels all at a characteristically human level" and has "perceptual insight that is superior to that of the major hemisphere for certain things" (1:213).

From these studies, then, there appears to be a clear hemispheric division: Language resides in the left hemisphere, while the right perceives figures and images in a direct, nonlabeled way. Both hemispheres think but the left hemisphere dominates since thinking is usually transmitted through language. Since visual material appears to draw upon the nonverbal ability of the mind and may well transmit meaning and allow the mind to make discoveries or reach conclusions in an intuitive rather than language-based way, the use of visual aids in technical writing seems to be clearly called for. But this model of the mind, as two equal and separate entities, one receiving language and the other nonverbal images, is actually a simplification of what is found when the mind is examined in terms of processing.

PROCESSING MODELS OF THE MIND

Processing studies look at what the mind does with specific kinds of input or stimulus; they tell little about where various brain functions occur or how parts of the mind are connected, but help to reveal the kinds of processes that act on sensory data. Such studies have revealed that language is processed in a dual coding system: when one reads, depending on the content of particular strings of words, the meaning is processed or encoded in two different forms.

Marschark and Paivio postulate that the mind's coding of language is based on whether the words or sentences have abstract or concrete meanings: that there is a dual coding process consisting of a nonverbal or imaginal system and a verbal system, "differentially accessible as a function of a stimulus concreteness."[3] Thus, a sentence such as "The lesson inspired devotion," because it deals with abstractions, would be restricted to processing within the verbal system. There it would be handled as a "sequential verbal code . . . closely tied to the organization of the input string" (2:218). It would be recalled as words with meaning dependent on word order. In contrast, a sentence composed of concrete words, such as "The farmer cut the wood," would be processed by the nonverbal system. There the meaning of the concrete sentence would "usually be represented by an integrated visual image . . . " (2:218). The meaning is then nonsequentially organized and recalled in a "specific and elaborated form . . . not exclusively tied to the original wording" (2:218). Because the image exists as a whole rather than as a sequence, it carries, at once, knowledge as component and whole.

Das, Kirby, and Jarman postulate another dual coding system. Their model is based on Luria's observation that the brain cortex is broadly "engaged in two types of integrative activity—simultaneous and successive."[3] The two processing modes differ in the way they make knowledge available for mental use. The essential nature of simultaneous processing "is that any portion of the result is at once surveyable without dependence upon its position in the whole" (3:89). Successive information processing depends on serial order; thus, "the system is not totally surveyable at any point in time. Rather, a system of cues consecutively activates the components" (3:89).

When applied to language, this dual processing theory holds that verbal material is understood primarily successively: "The structure of grammar is such that the processing of syntactical components is dependent upon their sequential relationships within sentence structure"(3:89). Nonverbal material, on the other hand, is processed simultaneously (3:99).

However, the authors do not emphasize the verbal/nonverbal aspects of this coding theory. Rather, they emphasize that ultimately all materials must be coded similarly: "The brain stores neither words nor pictures, rather representations of both, as well as much more" (3:99). Thus, linguistic material may also be analyzed simultaneously, and an image may be processed successively" (3:100).

A COMPREHENSIVE MODEL

So far the model of the mind explains little of use about how the mind deals with a text. If a picture may be processed simultaneously, we see some agreement with the neurological finding that the right half of the brain works with figures and images. Language processed successively would then be sent to the left hemisphere. But testing has shown that a visual perception may be processed in bits and that language may be processed as a whole; these fairly clear divisions then seem to fail.

The seeming failure can be explained by looking further into the process of reading a text. We envision a text as a composition made up of strings of words and nonverbal visual aids whose destination is the mind. We realize upon reflection, however, that it is not the text in any physical or representational sense that is taken into the mind; rather, it is the *meaning* of the text which the mind deals with. And when we deal with meaning, we must move away from how the text presents meaning to how the mind represents that meaning.

Both Marschark and Paivio and Das, Kirby and Jarman agree that some verbal material is processed in sequence in the mind; both agree that there is a second mode of processing in which concrete verbal material is processed as an image or nonverbal material is processed simultaneously. From their studies it may be concluded that some verbal material is processed sequentially, some nonverbal material is processed simultaneously, and that some verbal and nonverbal materials may be processed either successively or simultaneously. So the model is clearer.

To further clarify it and give clearer direction for the use of visual materials in technical writing, it is necessary to consider the way textual materials are represented in the mind for it is apparent that words in a text are not always processed in the left hemisphere, and visual materials in a text are not always processed in the right hemisphere.

Mental Representations

The studies cited suggest that strings of words developing abstract meanings are processed by the language center in the left hemisphere and are nonimagistic in form and in content. Concrete language is potentially image building. With such language there is evidently an intervening mental step in which words are replaced or supplemented by mental images which take on the form of pictures; these are pro-

ceased simultaneously and function as images. The general view holds that image and word strings are fundamentally different—that there is no clear conversion from one to the other and thus no apparent way to generate mental images when desired.

Propositional Knowledge

There is, however, a common ground in propositional knowledge. As used here, a proposition refers not to a string of words, but to what a string of words asserts. "A proposition may be asserted by any number of strings of words" or "it may involve no words of any kind."[4] A mental image generated by a string of words is necessarily made up of the propositions asserted by those words. Just as mental imagery coming from a verbal text will be made up of propositions, so too will a visual aid. "If a picture fails to state the relevant propositions perceptually, it is useless, incomprehensible, confusing, worse than no image at all."[5]

A Third Way of Thinking

The concept of mental images made up of propositional data brings up one last and particularly relevant concept as yet unexplored: visual and nonvisual presentations, whether they come from the text or from mental images formed from it, are not the ultimate form of data fed into the mind. Paivio and Marschark found evidence in their studies that supported both dual coding—where words and images are processed differently—and integrated coding, where the two are processed the same way. They concluded that "cognition may be 'mediated' by something quite different from either pictures or words, different in fact from anything which can be observed either from within or without" (4:4). They believe that all data must finally be represented in some common form; unfortunately, it is "not available to conscious experience . . . " (4:5).

CONCLUSION

Even though the code of the thinking system is not completely understood, some steps can be taken to communicate ideas more effectively. Since propositional knowledge appears to be the key to thinking, concrete propositional data rather than simply words or images should be a central part of technical papers. Further, propositional knowledge should be presented in such a way that it will be processed simultaneously, for only in this way can systems of relationships be grasped (3:89). Visual aids may be better and faster means of entering data into the mind where it can be grasped as a whole. Visual aids are not necessarily visual in their primary form, however; certain verbal materials may generate images and so will be processed that way. And if words do generate images, they must be chosen carefully. Finally, while meanings such as conclusions and discoveries may be recalled as words or pictures, they probably began as neither. There is meaning whose origin we may be unable to articulate.

A scientist may base a discovery on a mental image that contains propositions but which also evidently contains something else that has not or perhaps cannot be verbalized. As an example, Albert Einstein gave the following mental picture he visualized at the age of 16: "If I pursue a beam of light with the velocity C (velocity of light in a vacuum), I should observe such a beam of light as a spatially oscillatory electromagnetic field of light." Einstein explained that he reflected on this picture for ten years, until he realized that it could not be explained as long as the "absolute character of time" was "anchored in the unconscious."[6]

"If I pursue a beam of light with the velocity C . . ., I should observe such a beam of light as a spatially oscillatory electromagnetic field of light."

What is important about this image is the fact that it was not generated as an explanation or illustration of the theory of relativity. The image came to Einstein before there was a theory of relativity; it contained propositions familiar to Einstein but at least one idea that was consciously resisted or unrealized by him for ten years—that of the relativity of time. So, while the mental picture contained propositional data, it also contained something nonvisual, nonverbal, and nonpropositional in the usual sense of the word because the proposition of the relativity of time did not consciously exist until ten years later. It is a rare example of what I have termed the third way of thinking. It is difficult to understand from whence or how this mental picture came that contained the "germ of the special relativity theory" (6:53), but Einstein's conscious task apparently became one of working out and verbalizing the propositions he already somehow knew.

In using visual materials it must be remembered that the unnameable part of images or visual aids may be important also; while we should obviously reproduce what we can prove important in a text, we should also include what seems important. The same is true of language. We need abstract language and we need concrete, potentially visual language that enables us to understand concepts as a whole but we should also include metaphorical language. A metaphor may bring up nonpropositional, nonabstract, nonvisual but meaningful and necessary ideas. It may be that metaphorical language and mental images such as Einstein's are keys to spurring the mind through the third way of thinking; if so, they are not just important components of the reproduction of discovery but are important parts of the discovery process itself. Visual aids, then, should certainly be considered integral parts of a text.

END NOTES

[1] Roger W. Sperry, "Lateral Specialization of Cerebral Functions in the Surgically Separated Hemispheres," in *The Psychophysiology of Thinking*, ed. F.J. McGuigan and R.A. Schoonover. (New York: Academic, 1973), p. 218. Other references to this source are marked thus: (1: page).

[2] Marc Marschark and Allan Paivio, "Integrative Processing of Concrete and Abstract Sentences," *Journal of Verbal Learning and Behavior*, 16 (April 1977), 218. Other references to this source are marked thus: (2: page).

[3] J.P. Das, J. Kirby, and R.F. Jarman, "Simultaneous and Successive Syntheses: An Alternative Model for Cognitive Abilities," *Psychological Bulletin*, 82 (Jan. 1975), 88. Other references to this source are marked thus: (3: page).

[4] Zenon W. Pylyschyn, "What the Mind's Eye Tells the Mind's Brain: A Critique of Mental Imagery," *Psychological Bulletin*, 80 (July 1973), 6.

[5] Rudolf Arnheim, *Visual Thinking*. (Los Angeles: Univ. of California, 1969), p. 309.

[6] Albert Einstein, "Autobiographical Notes, tr. Paul A. Schlipp, *Albert Einstein: Philosopher-Scientist*, ed. Paul A. Schlipp (New York: Tudor, 1955), p. 53. Other references to this source are marked thus: (6: page).

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Visual Presentation of Technical Information

The books and articles English teachers read and write generally use only words to represent and convey information. A glance at any technical report, however, shows how important visuals—tables, charts, graphs, photographs, drawings—are to the scientist or engineer. No report would be considered complete or readable without them. Visual and verbal techniques of presentation parallel each other. This article is a brief guide to discussing visual techniques of presentation in technical writing classes.

NONVERBAL THINKING

Scientists, engineers, and architects often use visual devices as the first step in recording observations, projecting alternative solutions to a problem, consolidating data, and making concepts concrete. The visual serves as a tool for thinking.[1] Scientific information is gained primarily through observation. The visual record of these observations communicates across time and cultural barriers to advance the scientific community's understanding of natural phenomena. Recognition of the need for precise visual observation, for example, revolutionized anatomy and physiology in the sixteenth century. The medicine of the middle ages was based on theoretical systems dating to Antiquity; occasional diagrams of the body reflected generalized verbal description rather than clear observation of nature. It was Leonardo da Vinci whose anatomical drawings from life showed the power of astute observation, recorded so that other anatomists could compare the record to what they saw with their own eyes and thus validate the information. In *Reliable Knowledge*, John Ziman, a physicist, argues persuasively that observations recorded in drawings and photographs are the primary means of documenting and validating data in all scientific disciplines. Seeing is indeed believing.[2]

In addition to storing information, visuals also serve, as do words, as devices for manipulating ideas. Pattern recognition is a chief tool of science. I rarely have lunch with a colleague in engineering who hasn't, by the end of the meal, covered the placemats with blocks and diagrams that make concrete the concepts we discussed. Architects use sketches to project how a building might look on a site. Civil engineers use Critical Path Method (CPM) diagrams to schedule the arrival of equipment and people on a construction site. Through such devices one imposes a pattern on information. The pattern is multidimensional; it can show several things going on at once.

VISUAL PLANS FOR WRITING

Many students in technical writing classes are most comfortable thinking visually. Words are a more recalcitrant medium. Thus it is helpful to present some of the advice we give about writing, especially about the process of writing, a topic that lends itself easily to visual form, through analogies and patterns that match their visual awareness.

Ziman and S.I. Hayakawa (among many others) use the metaphor of the map as an explanatory tool: Ziman to explain scientific theories[3] and Hayakawa (based on the thinking of Alfred Korzybski) to explain language.[4] Ziman emphasizes the multidimensionality of a map, its suggestion (even in sketchy form) of relationships, its ability to summarize and contain vast amounts of information in a closely woven network, its capability of expression at several scales and stages of detail, its predictive powers. "More information can be read from a map than was needed to construct it."[5] Hayakawa uses the map to show the relationship of words to the territory of referents for which they stand, the extensional world. We often talk of the "roadmap" of a report, a highway for the reader through the evidence. The image can be a useful one when expanded for students. Draw a map of the information to be presented. Show alternate routes through it.

I also use another form of visual to show the writing process (Fig. 1). This is a flow chart of the steps involved in writing. In addition, the audiences who will read the report can be effectively charted (Fig. 2). The blackboard is an excellent medium for visual instruction. One student complained about an English professor who didn't use it; to this engineering student, teaching means filling the blackboard. (Take a look sometime at the blackboards in an engineering or science classroom building.) I used to conceive of each section of the board as a page; I began writing at the top, moved down until one section was filled, and then started at the top of the next. Now I find myself more frequently starting at the left side of the room and moving across the board in diagrams of process. Such diagrams seem to aid students in wrestling with their materials. It gives them an edge when later they must wrestle with words on paper.

VISUAL AND VERBAL PRESENTATION

As part of the writing process, in the outline stage, the writer needs to distribute information to the channel of communication most appropriate for it: visual, verbal, or mathematical. Visuals are not just "aids" to grace or stuff a report, but a major form of communication. The chief advantage of visuals, of course, is that they can say things that words cannot (not that they are automatically worth 1000 words). Visuals are nonlinear. They show simultaneity and sequence in time. They delineate whole areas of space. Writing and speaking are linear. A speaker can't say two sentences at once; a writer can't superimpose one sentence on another. One of my students sug-

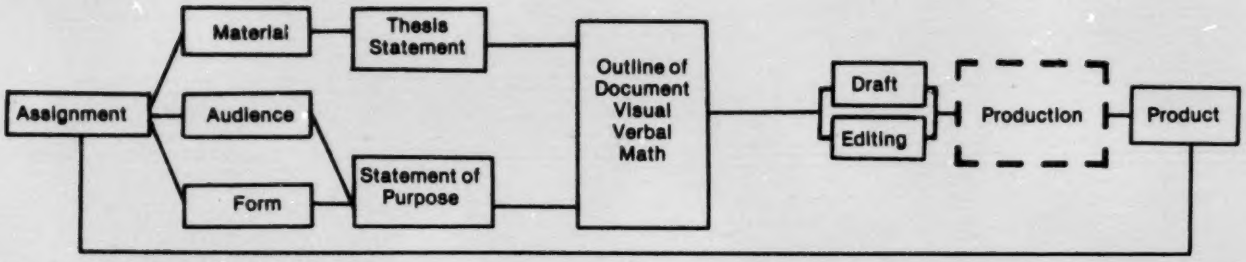


Figure 1. Sample Chart of the Writing Process

gested that he present his material, all neatly divided into components but resisting priority order ("What should I say first?") on the sides of a cube and give readers different vectors for reading. The idea is refreshing and useful in conceptualizing. But it won't work in a presentation that, at least in our current state, must be linear.

Certain kinds of information can only be presented visually, especially ideas that are quantitative or pictorial. Some information is more effectively presented visually than verbally. The choice of whether to use a visual, and what kind, depends, as with words, on the audience, occasion, and purpose of the communication. The available options for graphic presentation are covered in most technical writing texts.[6] Students usually learn techniques for drawing these in technical classes. But they may not learn how to draw them *out*, how to adapt them for presentation. Let me conclude, then, with an overview of some of the purposes for which one would choose a visual means of presentation.

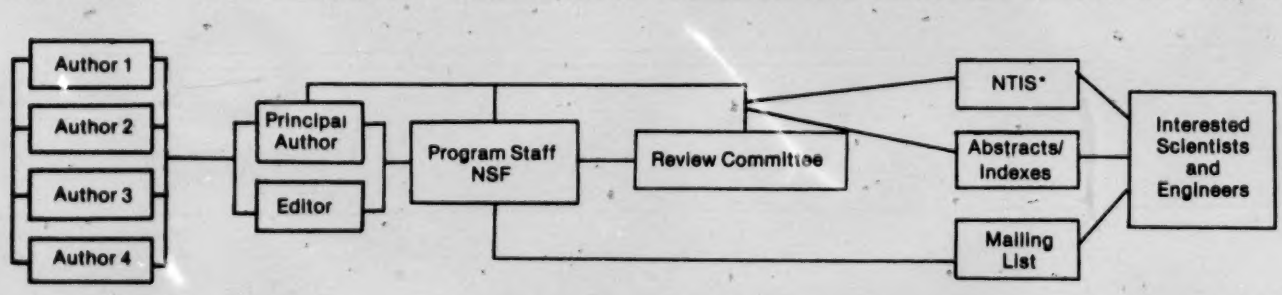
Motivation. One purpose for visuals is motivational. Visuals enhance interest in a presentation. A page of text without a visual looks forbidding and dull to most technical audiences. The visuals also ease skimming. Many readers simply look at the pictures to find what a document is about and whether they want to read more. Photographs and artwork capture the interest of nontechnical audiences. Although engineers and scientists may rightly suspect overly slick presentations and draw back from such documents as glossy proposal brochures, marketing people stress the significance of packaging—including well used visual elements—in selling management customers in both private industry and government. Similarly, company annual reports to stockholders are often well designed visual presentations stressing photographs of company employees and installations. Figures and charts draw attention to activities the company is proud of. For example, a graph of profits showing a straight ascent emphasizes and dramatizes a main point. (Conversely, losses are more likely to be presented in words, where negative numbers can be both couched in explanations and kept less directly accessible.)

Information. Another purpose for visuals is more directly informational. Visuals instruct and explain at many levels to different audiences. For a popular audience, visuals are useful in simplifying an idea (Fig. 3). Instructions for household maintenance or toy assembly are often accompanied by visuals that make concrete the steps to be taken. Visuals further transcend language barriers, as in the international system of symbols for restrooms, eating places, information booths. As a rough rule, the more unfamiliar the audience is with the procedure, the greater the number of visuals needed, to the point where instructions aimed at children may be entirely visual (thus avoiding problems with an inability to read!).

There are, of course, different degrees of difficulty in visuals. Some, like plots of logarithmic functions, require advanced understanding to interpret. Often, figures and charts present information at high density, and those drawn in the laboratory with great complexity may have to be streamlined to serve as tools of communication. An excess of information in a visual, like an excess of details in prose, overwhelms the reader and reduces the impact of each figure or chart. Labels and captions are signs of a shift in the use of visuals from documentation to communication and aid in knitting the verbal and visual texts together (Fig. 4). Visuals used in a publication can be more dense than those used in an oral presentation. It's not enough simply to talk with the same visuals used in a paper or article.

Visuals, then, aid an audience in understanding a message. People often remember a concept best when it is tied to a picture.

Signage. Visuals can serve as important signs for the reader about how to read and for the listener about how



*National Technical Information Service

Figure 2. Sample Audience and Distribution Network, Multiple Author Report for the National Science Foundation

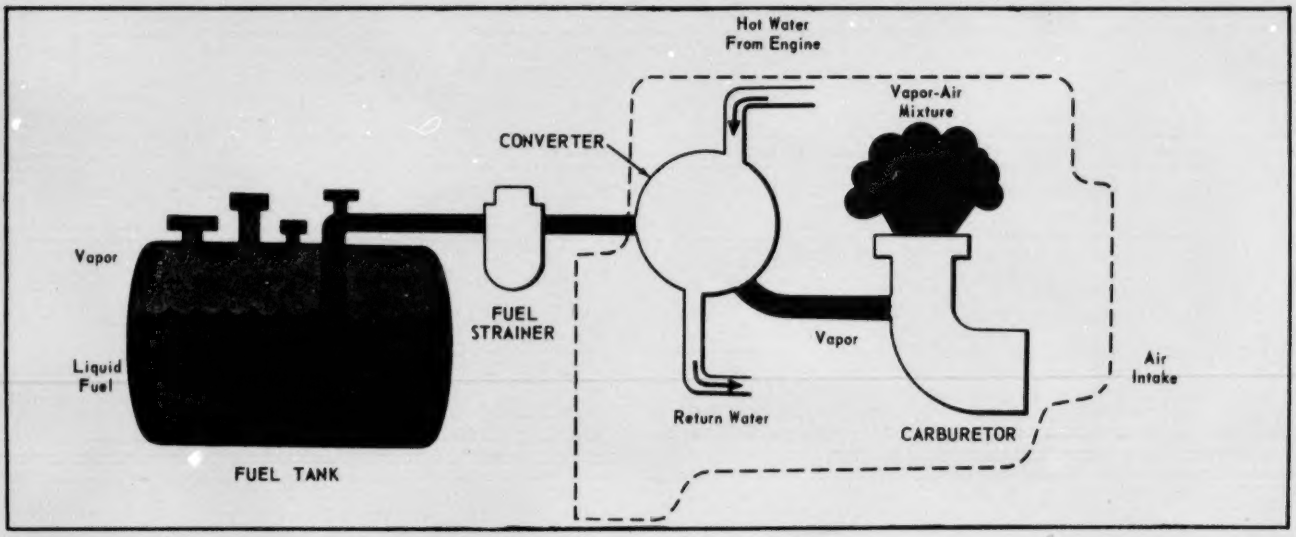


Figure 3. Visual Explanation of the LP-Gas Fuel System (Source: *FMO: Tractors*, Deere & Company, 1974, p. 45. Reprinted with permission of publisher.)

to listen and remember. They foster coherence. For example, an artist's design that represents a technical system can be repeated at the beginning of each section of a long report, with the component discussed in that section highlighted. When figures in a series are drawn in parallel form the formal parallelism underscores the substantive similarities. In an oral presentation, transparencies on an overhead projector may represent through a series of overlays the pieces of a puzzle. This build up becomes a pattern of transitions. Color coding is useful to reinforce concepts: green, for example, might represent positive results or steps; red, the negative. An image on the screen reinforces what the speaker is saying. Words included in the image encourage the audience to remember.

Aesthetics. Finally, visuals, like their verbal counterparts, serve an aesthetic purpose. Their use can be raised from skill to art. Some multimedia presentations, of course, become mere showmanship, sound-and-light shows aimed more at dazzling the audience than informing it. But often the visual element is a mark of professionalism and efficiency in conveying information.

CONCLUSION

Visuals, like words, can lie. Through either ignorance or malevolence, an author can misrepresent information in a visual.[7] One oil company official compelled to deliver some unfavorable statistics to stockholders concerning a plant's operation deliberately presented them in an out-of-focus slide which he hurriedly, and with apologies for the slide's technical qualities, flashed before the audience. Inappropriate scales, tricky suppressed zeroes, diverting pictographs—the devices for misleading are many.

But so are the devices for leading right. A *New Yorker* cartoon shows a speaker standing at a podium with a row of numbers seated behind him. The caption reads: "Now I'll let the numbers speak for themselves." Numbers can't always speak for themselves in a presentation. The author must speak or write for them. Visuals, too, represent a means of presenting information that must be planned early in the preparation of a document or speech (not just tacked on by an editor at the end) and integrated with verbal elements. Since visuals can be read in many ways, the text tells the reader how. To be persuasive, then, text and visuals should accurately reflect the material the author wishes to present. They should complement—and not, of course, rival or contradict—one another, so that the combination is more effective than either by itself.

END NOTES

[1] For an excellent article on this topic see Eugene S. Ferguson, "The Mind's Eye: Nonverbal Thought in Technology," *Science*, 197 (1977), 827-36.

[2] (Cambridge: Cambridge University Press, 1978), pp. 42-56.

[3] Ziman, pp. 77-87.

[4] *Language in Thought and Action*, 3rd ed. (New York: Harcourt Brace Jovanovich, 1972), pp. 27-30.

[5] Ziman, p. 83.

[6] In addition to the texts, see Robert Cury, "Visual/Graphic Aids for the Technical Report," *Journal of Technical Writing and Communication*, 9 (1979), 287-91.

[7] See D. Huff and I. Geis, *How to Lie with Statistics* (New York: Norton, 1954).

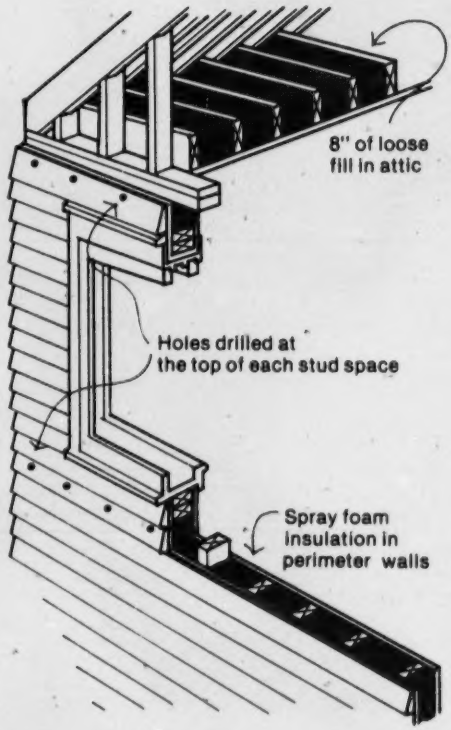


Figure 4. Insulation Plan. Verbal and Visual Elements Together (Source: D.C. Andrews and M.D. Blickle, *Technical Writing: Principles and Forms*, Macmillan, 1978, p. 278. Reprinted with permission of publisher.)

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Beyond the Basic Course:
Building a Program in Technical Communication

When the matter of going beyond the basic course in technical writing, of building a program in technical communication, is considered, several questions immediately surface. What kind of program? Is there a need for the program? What should be in the program? In this article, I will deal with each of these questions.

WHAT TYPE OF PROGRAM?

The new program may be considered at several levels. It may be desirable simply to add a course or two beyond the basic technical writing course. Typically, the curriculum might include a basic writing course that deals with fundamentals, such as audience analysis and process and mechanism descriptions, followed by an advanced course that deals with such applications as proposals and feasibility studies. If there is a basic course that covers all the above, the additional course or courses may be even more specialized; for example, writing for publication or report and thesis writing. When such courses are added, the audience is still primarily the technical students for whom the original course was designed.

At a more complex level four or five courses may be added beyond the original course. To the two or three courses already mentioned, courses on editing and production and courses in even more specialized kinds of writing, such as technology assessment or industrial advertising, might be added. At this level there are probably enough courses to offer an emphasis or a minor in technical writing. The audience will still be the technical students, but at this point a new dimension will likely be added. Some of these students, whatever their major, may be thinking of becoming professional communicators.

The third level is the full program where a major in technical writing, or more likely, technical communication is administered. At this level, in addition to the courses already mentioned, such courses as graphic and oral presentations will be needed. Some courses in communication theory, and so forth may also be included. The rest of the student's course work must be outlined as well; that is, it will be necessary to build a program that follows the dictates of the school concerning curricula while designing an interdisciplinary program that produces people capable of working as professional technical communicators.

Obviously, the level chosen depends upon the situation, resources, and desires. The rest of my comments are meant to be a guide regardless of level selected.

IS THERE A NEED FOR THE PROGRAM?

My second question concerns the need for such programs, a question which can be answered fairly objectively. In a 1977 article Richard M. Davis reported the results of a survey he conducted among persons listed in *Engineers of Distinction*.[1] In summary, Davis reported the following:

- The respondents spent an average of 24.35% of their time writing.
- The respondents spent 31% of their time working with other people's written materials.
- Most of the respondents felt that the ability to write effectively is either very important or of critical importance to them.
- Almost all reported that as their responsibility increased, so did their need to write.
- Almost all felt that the ability to write well had contributed to their advancement.
- In advancing subordinates, almost all considered their writing ability.

Numerous other articles in the literature attest to the same demand for writing skills for technical and business people.

Those of us who have the opportunity to consult in business and industry see at firsthand the tremendous need for good communication skills on the part of even low ranking executives. We see also how poorly most have been served by their college educations in the development of these skills.

Those of us who run programs complex enough to turn out professionals in technical communication know of the strong demand for our graduates. Technical writing at the moment is a growth industry. One firm in Minneapolis offers $500 to any employee who recruits an employable technical writer. Starting salaries for our graduates now approach the salaries of beginning engineers.

In other words, at whatever level a program is offered, a need will be filled. The need exists all around once we go beyond the bounds of academic walls. Unfortunately, those in power within our academic communities do not always perceive the need, but persuasive evidence is available if sought and delivered.

WHAT SHOULD BE IN THE PROGRAM?

My third and final question concerns the content of such programs. Let me first give a few personal opinions based upon my experience and then follow with some research data. My personal comments concern primarily those courses that may be offered for technical people who do not intend to become professional writers. These are the people with whom I consult several times a month. What kind of writing do they do? Strange as it may seem, they really do most of the kinds of writing that the technical writing books cover. Business people write procedures of all sorts. They have to tell other people how to do things. They do analytical decision reports. They make proposals and report progress. They report re-

search results. They do correspondence and memorandums of all sorts. They worry about audience and particularly about mixed audiences of varied abilities and interests. Here is a memorandum written by the training director of a large insurance company concerning a Report Writing Class based upon company needs:[3]

The following is a list of objectives for a Report Writing Class pilot program. This list is drawn from your comments on the needs analysis done December 5, 1978. Each objective is a statement of what the trainees will be able to do if training is successful. These needs will be communicated to the consultant selected to run our pilot.

Please review the list to determine relevance to your department's needs. Call me by December 29, 1978, if you have any suggestions for improving the list.

Report Writing Trainees should be able to

1. Identify the target audience(s) of each of their reports by functional area and job level.
2. Write a one sentence statement detailing the purpose of the report, that is, what the information is to be used for.
3. List the significant findings of the report in descending order of importance to the target audience.
4. Construct a framework (outline) for a report that is appropriate to both the target audience and stated purpose.
5. Compose (from the outline) a report that is
   A. Informative and concise
   B. Logically organized
   C. Free of departmental jargon (foreign to target audience)
   D. Free of mechanical errors
   E. Readable
   F. An accurate depiction, where appropriate, of statistical data.

In short, there are enough subjects to cover that students will someday need for two or even three courses. Students would also profit by more practice and detailed coverage in all the writing tasks they will one day have.

While primary attention should be on the writing students will do after they graduate, the writing they need to do at school should not be neglected entirely. For example, I have a course in report and thesis writing for graduate students. The course fills with students who want, need, and appreciate greatly all the help they can get in the academic exercise.

The research data I report here deals primarily with the full-scale programs that could be used for a minor or major in technical communication, but they also offer some clues regarding the more basic courses for technical people.

In 1977, Richard Wiegand sent questionnaires to members of the Society for Technical Communication concerning the content of technical communication programs. This research was conducted as part of the work of the Society's Curriculum Development Committee which I chair. The full results of Mr. Wiegand's research will soon be reported by him and John Brockman in STC's journal, *Technical Communication*, but a few of the preliminary results are pertinent here.

In answer to the questions, "Should a degree in technical communication include communication courses with more theory or more methods?" the over 800 respondents answered as follows: more theory, 6%; more methods, 39.9%; equal amounts, 54.1%.

The communication courses that received the most support were the following: Editing, 21.1%; Communication research methods, 10.9%; Technical drawing, 10.6%; Business communication, 8.5%; Report production (printing, etc.), 8.1%; Technical/Science writing, 7.5%.

In 1979 Dr. Earl McDowell of our department did a survey to evaluate our program at Minnesota. He sent questionnaires to three groups: members of the Society for Technical Communication, potential employers of our students, and graduates of our program. The participants in the survey were asked to rate the communication courses in our program on a scale of 1 (very unimportant) to 5 (very important). Obviously, this survey is biased to a degree by the courses we offer in the major. The STC members chose the following as the top eight courses:

1. Scientific and Technical Writing
2. Interviewing
3. Scientific and Technical Presentations (speech and graphics)
4. Writing for Publication
5. Scientific and Technical Graphics
6. Transfer of Technology
7. Professional Writing
8. Direction of Training in Business and Service Organizations

Potential employers ranked them this way:

1. Scientific and Technical Writing
2. Transfer of Technology
3. Scientific and Technical Presentations
4. Writing for Publication
5. Effective Listening
6. Scientific and Technical Graphics
8. Professional Writing
8. Interviewing

The graduates ranked them this way:

1. Scientific and Technical Writing
2. Scientific and Technical Presentations
3. Advanced Public Speaking
4. Scientific and Technical Graphics
5. Writing for Publication
6. Professional Writing
7. Interviewing
8. Studies in Organizational Communication, Conflict, and Change.

While Scientific and Technical Writing is the top course for all three groups, the top eight courses include other communication skills. Writing is seen as the most important skill for a technical communicator, but he or she must also speak, listen, interview, and understand graphic presentation and communication theory. A full program cannot be based on writing alone. Our graduates also tell us we must stress report production and management more than we do.

My purpose here has been in the main informational. I've raised some of the major questions that must be asked if expansion of technical communication offerings is planned, and I've suggested some of the answers. Technical writing has come of age: in Professor James Souther's words, it is "a discipline just as is creative writing and is journalistic writing."[3] As technical writing has become a discipline its teachers and practitioners have defined its characteristics. Most would agree that technical writing is all of the following:

- Objective
- Heavily involved with graphics, formats, and report design
- Action oriented
- Practical
- Persuasive
- Situational
- Analytical
- Audience oriented
- Highly rational and disciplined
- Important

With these characteristics in mind and the knowledge that a full-scale technical communication program involves more than writing, the educator will be on the right track in building beyond the basic course.

END NOTES

[1] Richard M. Davis, "How Important is Technical Writing?—A Survey of the Opinions of Successful Engineers," *The Technical Writing Teacher* 4, No. 3 (1977): 83-88.

[2] Robert A. Lauer, St. Paul Companies, St. Paul, Minnesota, 1978.

[3] James W. Souther, "Writing is for *Other* People," *The Technical Writing Teacher* 6, No. 2 (1979): 38.

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Mistakes Made by Writing Consultants

Consulting is a big business. During a given year in a given corporation, consultants will be hired to train employees in everything from Occupational Safety Hazards Act (OSHA) Guidelines to driver's education. They will motivate people to be better employees, involve them in roleplay, and evaluate their working space and the colors of their walls and furniture.

Among the hottest areas the past few years has been consulting in writing—especially report writing in high-technology corporations. If you are competent in that area, you may be able to add substantially to your present income.

However, the flunk-out rate among writing consultants is high. The following pages, lifted from the writer's forthcoming book, *The Writing Consultant's Guide*, describe some of the things that go wrong—and what you can do about them.

EVERYTHING THE T.D. WAS AFRAID TO TELL YOU

Just as there are "push" reports and "pull" reports in industry, there are training directors who push and those who are able to pull. You understand the distinction—the push syndrome is set up when somebody is forcing something, a report or a seminar, into being. The pull syndrome occurs when somebody, often management, wants something.

The potential for antagonism in a "pushed" industrial seminar is high. Sometimes you will sense (nobody will tell you) that 15 participants are there because they want to be and five have been pushed. Some manager somewhere wants improvement in those people—or else.

Sometimes the best-intentioned participants have the most trouble getting to your report writing seminar. Three of them just got back from Tucson and they have to file a trip report and schedule a meeting in Seattle for Monday. They are harried, distracted, and sometimes absent.

Then there are the no-shows and the one-shows. The no-shows are on the list of attendees but never make it and you never know why. The one-shows come one time and never come back. When somebody asks them why, they say, "I already know all that boring stuff and don't use any of it."

Or something similar. You find yourself panned by a critic who left in the middle of the first act.

Sometimes one comment from you will be sufficient to turn away a one-show. He asks, "Why don't we deal with linguistics in here, the way they do at my kid's school? Isn't that the *modern* approach?"

You reply, "We can't get into it. We have to build on what you already know. Linguistics is a science and to deal with it here would be like trying to teach brain surgery in 12 hours."

"Uh-huh," says the one-show.

Tread softly with these people. After the first few hours, you will all settle in and enjoy the experience.

However, match the cynicism in the voice of a one-show, and you have started your own countdown.

YOU ARE NOT PRINCESS GRACE

This needs to be said emphatically. Some of the people who want to be consultants are like Princess Grace of Monaco. A magazine recently ran an article about Princess Grace and the sheets and pillow cases she is designing as an avocation. The sheets and pillow cases were beautifully displayed in the article. Some had bamboo and fern designs; some had butterflies. Others had birds flying over their surface.

Do you think Princess Grace actually did all those tedious designs? Or did she say to some impecunious but talented artist in the South of France, "Pierre, I want a jungle scene on this one and butterflies on this one."

That's right. And a lot of people who want to be consultants are like that—secretly or outwardly. These people want to walk into a room filled with people and do their magic. And leave.

You are not Princess Grace.

YOU ARE NOT JOHNNY CARSON

You should enjoy what you are doing, as a good craftsman enjoys running his hand over a smooth cabinet surface. But not too much.

You absolutely cannot play much of the seminar for laughs. Oh, you know that people remember a lot more when they are happy. And you have dozens of delightful boners and double-entendres you have collected from *The New Yorker*. Your students laugh uproariously when you filter these into your lectures.

But these are *not* students. They are serious, professional people who have to figure out ways to cut costs and make a profit without a massive layoff of employees.

Some humor is fine, of course. But the quip-a-minute, variety show approach will result in a lot of "1's" on the evaluation sheets.

Bill Allison, a very astute vice president for public relations with a large bank, once crinkled up his nose at a competitor's attempts to get business through humorous ads. "Money is not funny," he said.

And you are not Johnny Carson.

DON'T RIDE A HOBBY HORSE

A specifications writer is a specialist. Not everybody has to do it. Not many people want to. If you are an excellent specifications writer, you may be tempted to talk about specs throughout a 24-hour seminar. Don't do it.

Don't ride a hobby horse.

A notorious professor at one Texas university once went on a margins-kick which lasted for years. That was all students in his classes could remember of him after the semester was over.

Margins. He measured them, he marked them, he showed them on viewgraphs. He had a hobby.

There are lots of hobby horses. Some of their names are proposals, annual reports, and physical research.

None has ever won the Derby.

OTHER NEVERS

There is an adage in the newspaper business that you "never say never or always." But let's ignore it.

Never:

1. Ask "Why are we here?" You are supposed to know and they are uncomfortable if you don't.

2 Knock management or their industry. They may, but you certainly will not.

3. Get far beyond your specialty. Writing influences behavior, but you are probably not a behavioral scientist.

4. Get chummy with anyone in your seminar. Somebody always wants to—and it skews things around. You keep making eye contact with him or her and others notice it.

THE AUDIENCE THAT'S SMARTER THAN YOU ARE

What to do when you find yourself in a room with a dozen ice-physicists, all of whom have Ph.D.s from MIT and IQs of 150 and up?

It's not as remote a possibility as you may think.

Many homogeneous high-technology audiences are like this. They are all *so* smart they exempted most of their English classes. They are *so* specialized that they never got around to technical writing.

Sometimes these people are not only smarter than you are, they are smarter than management, too. And management frustrates them by cutting off research funds or taking away one of their projects and marketing it before they have perfected it.

If this audience is really *hostile* to management, you have found yourself in the toughest of all consulting situations.

Don't get into a smart-contest with them. (They *will* respect your Ph.D., if you have one. It's what separates you and them from management.)

OLD ENOUGH TO KNOW BETTER, TOO YOUNG TO CARE

Somewhere along the way, you will be tempted to say, "What the hell. Let's mix it up." It goes with the territory. You see, there is this aura of arrogance around high-verbals. People in the corporation can sense it. And . . . .

Don't do it. Don't flaunt your authority over the material, your education, awareness of what management wants, your intelligence. Don't be drawn into anything "just for the sake of argument."

You are a non-combatant.

NEVER WALK IN WITH ONE BULB

Over-prepare. Always have more of everything that you will need. Projector bulbs, exercises, lecture materials, slides. Bulbs pop, managers want samples of exercises, materials don't work, and the audience may sit mutely—but attentively—as the slides flash by, absorbing each one more quickly than you had anticipated and ready for the next.

If you over-prepare, it helps you think on your feet. It gives a sense of security and you can be loose—the way a good fireballing pitcher is.

IF IT IS SO IMPORTANT, WHY DIDN'T I LEARN IT IN SCHOOL?

This is one of those no-win questions.

Colleges and universities probably should encourage students who will enter industry to take technical report writing. But, you see, there are these vested interests. Technical writing, which came late to the campus, is an intruder. An outsider. It smacks of colleges such as East Tennessee Body and Fender.

Try to explain educatonal chauvinism to a group of people from industry. On the other hand, don't do it. They will catch on after a couple of sessions and go away saying something like, "Gee, I wish I'd had the opportunity years ago . . . ."

WHERE THEY BALK

They *will* balk. And you have to be ready for it. Participants balk when you force them to clean out the top right-hand drawer of their desks, where they store those old reports they use for models. Take those models away and the drawer is empty. They had *something* before you came. Now they have nothing.

They will balk when they must unlearn something, when they must learn something totally different from what they are used to (such as saying "I" in a "formal" report) and they will balk when they must throw away something.

Fill their top right-hand drawer with crisp new report models and they will get movin' again.

PUNTING

What do you do when you are challenged, disputed, refuted, or wrong?

If you are challenged or disputed, you can often get a good give-and-take session going that may benefit everyone. You can turn their testiness to approval.

If you are refuted or wrong, you can:

1. Say, "I don't know but I will try to find the correct answer—if there is one."

2. Promise to have it next time.

3. Call in an expert, if the corporation approves and if the matter is serious—the gas tank had really exploded. You may find your expert in another division of the corporation, or in another corporation—keep the seminar non-proprietary while he is there and maybe you can get approvals.

WHAT IF YOU STILL FLUNK OUT?

If you anticipate most of the things that can go wrong, you can avoid flunking out as an industrial consultant in report writing. If you have anticipated them and you *still* flunk out, as quite a few people do:

1. You don't know your material as well as you thought you did.

2. You are just a dull guy and will have to sell real estate to enhance your income.

3. You were so unfortunate as to get trapped in a no-win.

Never forget that your success as a consultant is important to a lot of people in the corporation. You may have more support than you realize. They don't want to break in a new consultant any more than you want to fail.

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The Essentials of Education

Society must reaffirm the value of a balanced education.

Leaders of several professional organizations reached this conclusion in 1978. They circulated a statement on the essentials of education among a number of professional associations whose governing boards endorsed the statement and urged that it be called to the immediate attention of the entire education community, of policy makers and of the public at large.

The statement that follows embodies the collective concern of the endorsing associations. It expresses their call for a renewed commitment to a more complete and more fulfilling education for all.

The associations invite the concurrence, support, and participation of everyone interested in education.

Public concern about basic knowledge and the basic skills in education is valid. Society should continually seek out, define, and then provide for every person those elements of education that are essential to a productive and meaningful life.

The basic elements of knowledge and skill are only a part of the essentials of education. In an era dominated by cries for going "back to the basics," for "minimal competencies," and for "survival skills," society should reject simplistic solutions and declare a commitment to the essentials of education.

A definition of the essentials of education should avoid three easy tendencies: to limit the essentials to "the three R's" in a society that is highly technological and complex; to define the essentials by what is tested at a time when tests are severely limited in what they can measure; and to reduce the essentials to a few "skills" when it is obvious that people use a combination of skills, knowledge, and feelings to come to terms with their world. By rejecting these simplistic tendencies, educators will avoid concentration on training in a few skills at the expense of preparing students for the changing world in which they must live.

Educators should resist pressures to concentrate solely upon easy-to-teach, easy-to-test bits of knowledge, and must go beyond short-term objectives of training for jobs or producing citizens who can perform routine tasks but cannot apply their knowledge or skills, cannot reason about their society, and cannot make informed judgments.

Educators agree that the overarching goal of education is to develop informed, thinking citizens capable of participating in both domestic and world affairs. The development of such citizens depends not only upon education for citizenship, but also upon other essentials of education shared by all subjects. The interdependence of skills and content is the central concept of the essentials of education. Skills and abilities do not grow in isolation from content. In all subjects, students develop skills in using language and other symbol systems; they develop the ability to reason; they undergo experiences that lead to emotional and social maturity. Students master these skills and abilities through observing, listening, reading, talking and writing *about* science, mathematics, history and the social sciences, the arts and other aspects of our intellectual, social and cultural heritage. As they learn about their world and its heritage they necessarily deepen their skills in language and reasoning and acquire the basis for emotional, aesthetic and social growth. They also become aware of the world around them and develop an understanding and appreciation of the interdependence of the many facets of that world.

More specifically, the essentials of education include the ability to use language, to think, and to communicate effectively; to use mathematical knowledge and methods to solve problems; to reason logically; to use abstractions and symbols with power and ease; to apply and to understand scientific knowledge and methods; to make use of technology and to understand its limitations; to express oneself through the arts and to understand the artistic expressions of others; to understand other languages and cultures; to understand spatial relationships; to apply knowledge about health, nutrition, and physical activity; to acquire the capacity to meet unexpected challenges; to make informed value judgments; to recognize and to use one's full learning potential; and to prepare to go on learning for a lifetime.

Such a definition calls for a realization that all disciplines must join together and acknowledge their interdependence. Determining the essentials of education is a continuing process, far more demanding and significant than listing isolated skills assumed to be basic. Putting the essentials of education into practice requires instructional programs based on this new sense of interdependence.

Educators must also join with many segments of society to specify the essentials of education more fully. Among these segments are legislators, school boards, parents, students, workers' organizations, businesses, publishers, and other groups and individuals with an interest in education. All must now participate in a coordinated effort on behalf of society to confront this task. *Everyone* has a stake in the essentials of education.

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International Reading Association
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